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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------------|-------------|----------------------|-----------------------|------------------|
| 10/669,864 | 09/24/2003 | Dana A. Gronbeck | 51757 | 5134 |
| 21874 | 7590 | 03/29/2005 | EXAMINER | |
| EDWARDS & ANGELL, LLP | | | WILLIAMS, ALEXANDER O | |
| P.O. BOX 55874 | | | ART UNIT | |
| BOSTON, MA 02205 | | | PAPER NUMBER | |
| | | | 2826 | |

DATE MAILED: 03/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/669,864

Applicant(s)

GRONBECK ET AL

Examiner

Alexander O. Williams

Art Unit

2826

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) 10-26 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 8/4/04 and 11/22/0
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

Art Unit: 2826

Serial Number: 10/669864 Attorney's Docket #: 51757

Filing Date: 9/24/03;

Applicant: Gronbeck et al.

Examiner: Alexander Williams

This application claims the benefit of provisional application number 60/413265, filed 9/24/02.

Applicant's election of species of figure 2A in which related to the complete species of figures 2A-2J (claims 1 to 9), filed 12/2/04, has been acknowledged.

This application contains claims 10 to 26 drawn to an invention non-elected with traverse.

The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claims 1 to 9 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1-9, it is unclear what is meant by the claimed structure being described a being removable. What is the final structure claimed.

Any of claims 1 to 9 not specifically addressed above are rejected as being dependent on one or more of the claims which have been specifically objected to above.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains.

Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

Initially, and with respect to claims 1 to 9, note that a "product by process" claim is directed to the product per se, no matter how actually made, In re Hiraio, 190 USPQ 15 at 17 (footnote 3). See also In re Brown, 173 USPQ 685; In re Luck, 177 USPQ 523; In re Wertheim, 191 USPQ 90 (209 USPQ 554 does not deal with this issue); In re Fitzgerald, 205 USPQ 594, 596 (CCPA); In re Marosi et al., 218 USPQ 289 (CAFC); and most recently, In re Thorpe et al., 227 USPQ 964 (CAFC, 1985) all of which make it clear that it is the final product per se which must be determined in a "product by process" claim, and not the patentability of the process, and that, as here, an old or obvious product produced by a new method is not patentable as a product, whether claimed in "product by process" claims or not. Note that Applicant has burden of proof in such cases as the above case law makes clear.

Claims 1 to 9, **insofar as they can be understood**, are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kessler et al. (U.S. Patent # 5,110,712).

Claim 1. Kessler et al. (figures 1 to 5) specifically figure 4 show an electronic device comprising a first dielectric layer 14 comprising a first removable material, and a second dielectric layer 30 comprising a second removable material.

Art Unit: 2826

Claim 2. The electronic device of claim 1, Kessler et al. further comprising an etch differentiating layer disposed between the first dielectric layer and the second dielectric layer.

Claim 3. The electronic device of claim 2, Kessler et al. show wherein the etch differentiating layer comprises a third removable material.

Claim 4. The electronic device of claim 1 wherein at least one of the first removable material and second removable material comprises cross-linked polymeric particles.

Claim 5. The electronic device of claim 1, Kessler et al. show wherein the first dielectric layer and the second dielectric layer have an etch differential of at least 1:2.

Claim 6. The electronic device of claim 1, Kessler et al. show wherein both the first dielectric layer and the second dielectric layer are inorganic.

Claim 7. The electronic device of claim 1, Kessler et al. further comprising a third layer on the second layer, wherein the third layer is inorganic.

Claim 8. The electronic device of claim 7, Kessler et al. show wherein the third layer comprises a fourth removable material.

Claim 9. The electronic device of claim 9, Kessler et al. show wherein the third layer has sufficient porosity to allow for removal of the first removable material and the second removable material through the third layer.

As to the grounds of rejection under section 103, see MPEP § 2113.

US 5110712 A

May 5, 1992

INT-CL (IPC): G03C005/00, H01L021/31

BASIC-ABSTRACT:

A composite dielectric layer is formed in an integrated circuit to facilitate high density multi-level interconnects with external contacts through the use of high strength dielectric layers to support high stress metal layers. This composite dielectric layer is fabricated by:- (1) forming a polymer layer (20) on a first inorganic layer (14) to provide a planarised surface (22), (2) Depositing a second inorganic layer (24) on the planarised surface (22) to form an inorganic mast (30) for etching polymer layer (20), and (3) Etching polymer layer (20) using first inorganic layer (14) as an etch stop to allow long over etches to achieve full exposure of external contact surfaces of conductors to be connected to subsequently deposited metal layers (40, 42).

Art Unit: 2826

A polyimide polymer layer (20) is deposited onto the underlying layers (14, 12), which include metal features (16, 18), by suspending in a solvent and uniformly distributing by spinning the integrated circuit device being formed. The 4000 Angstrom thick polymer layer (20) is pref. thermally cured to remove the solvent, after which it is baked at low temp. to drive out any moisture. Deposition of the second inorganic layer (24) pref. comprises applying SiO₂ using either plasma enhanced CVD or atmos. pressure deposition or Si₃N₄ using plasma enhanced CVD. A masking layer (28) is then formed on the SiO₂/Si₃N₄ layer (24) pref. by depositing a photoresist layer that is highly planarised so that small features can be transferred to the polymer layer exposing the photoresist layer photolithographically with a predetermined masking pattern, and etching.

ABSTRACTED-PUB-NO: US 5110712A

Composite dielectric sandwich is formed in an integrated circuit (I) by the use of inorganic dielectric layers. Firstly, a first inorganic dielectric layer (II) is formed, over at least one underlying layer of (I), that has sufficient strength to protect the underlying layer, by distributing stress from subsequently formed metal features that are deposited on layer (II).

First metal features are then formed on layer (II). A polymer layer (II) is formed over layer (II), and the first metal features to (I), layer (III) being uniformly distributed to provide a planarised surface. A second inorganic dielectric layer (IV) is then deposited in (I), over layer (III), that provides sufficient strength to protect layer (III) by distributing stress from subsequently formed second metal features that are deposited on layer (IV).

A mask is formed on layer (IV). Layer (IV) is etched, using the mask as a masking pattern, to form an inorganic dielectric mask (V), and to provide a protective layer for etching of any subsequently deposited polymer layers. Layer (III) is etched, using the mask (V) as a masking pattern, to remove all polymer unmasked by mask (V), between mask (V) and layer (II), such that layer (II) functions as a protective and etch stop for the underlying layers, wherever the etching of layer (III) continues after all the unmasked polymer has been removed to fully expose any existing external contact surfaces of the

Art Unit: 2826

first metal features. Layer (IV) is maintained as an insulating layer that, together with layer (III), forms the composite dielectric sandwich that has sufficient strength to distribute stress from subsequently formed second metal features and that remains in (I) as an etch stop layer for subsequently formed layers in a multilayer integrated circuit. Finally, second metal features are formed on layer (IV) on in vias formed by etching layer (III).

ADVANTAGE - etch selectivity concerns between the polymer and the photolithographic mask are eliminated, allowing small features to be easily transferred into the polymer using standard dry etch techniques.

The listed references are cited as of interest to this application, but not applied at this time.

| Field of Search | Date |
|---|--------|
| U.S. Class and subclass: 257/700,701,758,760,759 | 3/2/05 |
| Other Documentation: foreign patents and literature in 257/700,701,758,760,759 | 3/2/05 |
| Electronic data base(s): U.S. Patents EAST | 3/2/05 |

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alexander O. Williams whose telephone number is (571) 272 1924. The examiner can normally be reached on M-F 6:30-7:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn can be reached on (571) 272 1915. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 2826

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Alexander O Williams
Primary Examiner
Art Unit 2826

AOW
3/3/05